*REMARKS*

*Discussion of Claim Amendments*

Claim 1 has been amended to further sharpen the claim language by reciting that the surface layer is formed from a mixture comprising at least one hydrophilic polymer having a melt index of about 0.5 g/10 min or less and an ultrahigh molecular weight polyethylene having a weight average of molecular weight of about 400,000 atomic mass units or more, and to recite that the hydrophilic polymer is poly(ethylene oxide) or a copolymer thereof. Claims 5 and 21 have been amended to recite poly(ethylene oxide) as the hydrophilic polymer. Claim 11 has been made to depend upon Claim 1. New Claims 23-25 have been added and are directed to embodiments of the invention. For example, Claim 25 is supported by the specification paragraph 0011. No new matter has been added by way of these amendments.

*Discussion of Restriction Requirement*

Applicants hereby affirm the election of Group I, Claims 1-10, with the traverse, for further prosecution. Applicants respectfully submit that the restriction requirement is erroneous. There does not appear to be a serious burden on the examiner to examine the claims of Groups I and II together. It is likely that the search results would overlap significantly. In view of the foregoing, Applicants respectfully request reconsideration of the restriction requirement.

The Office has withdrawn Claims 11-22 as directed to non-elected invention. As discussed, Claim 11 has been made to depend upon Claim 1 and includes the limitations of claim 1. Claims 11-22 are process claims, whereas Claims 1-10 and 23-25 are product claims. In the event that the Office does not withdraw the restriction requirement, applicants respectfully request that the process claims should be rejoined with the product claims if a product claim is subsequently found allowable, in accordance with 37 CFR § 1.21 and MPEP § 821.04.

*Discussion of Rejection*

Claims 1-10 are rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over James et al. (US 2003/0083433 A1). The Office states that James et al. discloses a medical device having an outer layer comprising a hydrophilic polymer commingled with ultra high molecular weight polyethylene (UHMWPE) having weight average molecular weight 400,000 or higher. The Office further states that James et al. suggests crosslinking by thermal, ultraviolet or other suitable energy for chemical covalent bonding. The Office admits that James et al. fails to disclose claimed melt index of hydrophilic polymer. However, the Office contends that a person of ordinary skill in the art would have found it obvious to utilize a high molecular weight or low melt index hydrophilic polymer in combination with UHMWPE to match melt viscosity to homogeneously mix both polymers.

Although applicants disagree with the rejection, applicants have amended the claims. James et al. fails to disclose or suggest to those of ordinary skill in the art the invention of claims 1-10 as presently recited. Specifically, James et al. fails to disclose or suggest to those of ordinary skill in the art an implant or part thereof whose surface layer is formed from a mixture comprising polyethylene oxide, or copolymer thereof, having a melt index of about 0.5 g/10 min or less and an UHMWPE. James et al. teaches that polyethylene glycol is suitable for use in its invention in combination with UHMWPE (see paragraphs 0018 and 0032). Those of skill in the art would know that the term "polyethylene glycol" refers to a fairly low molecular weight material, typically less than 10,000 amu. See, for example, the Wikipedia definition (copy attached) that polyethylene glycol refers to an oligomer or polymer with low molecular weight while polyethylene oxide is used for higher molecular weights. James et al.'s teaching of polyethylene glycol does not suggest polyethylene oxide. The Office would fail to make a *prima facie* case for obviousness.

To establish a *prima facie* case for obviousness, the Office must satisfy *three* requirements: (1) the prior art relied upon must contain some suggestion or incentive, coupled with knowledge generally available in the art at the time of the invention, that would have motivated those of ordinary skill in the art to modify a reference or combine the references. See, e.g., *Karsten Mfg. Corp. v. Cleveland Gulf Co.*, 242 F.3d 1376, 1385, 58 USPQ2d 1286, 1293 (Fed. Cir. 2001); (2) the proposed modification of the prior art must have had a

reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. In other words, hindsight analysis is not allowed. See *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1209, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991) ("While the idea of using a monkey gene to probe for a homologous human gene may have been obvious to try, many pitfalls existed that would have eliminated a reasonable expectation of successfully obtaining the EPO gene. Hindsight is not a justifiable basis on which to find that ultimate achievement of a long sought and difficult scientific goal was obvious."); and (3) the prior art reference or combination of references must teach or suggest all the limitations of the claims. See *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970) ("All words in a claim must be considered in judging the patentability of that claim against the prior art.").

There is nothing in James et al. that motivates one of ordinary skill in the art to select polyethylene oxide (a polymer of high molecular weight) in the face of a teaching where polyethylene glycol is used. Turning to the scope and content of James et al., the reference is concerned mainly with hyaluronic acid (HA); see Figs. 3A, 3B, and 4; paragraphs 6, 20, and 50-54, and Examples 1-2, and Attachment A (IPN Surface Modification of Ultra High Molecular Weight Polyethylene for Lowering Friction and Wear in Total Joint Replacement). To incorporate HA into the UHMWPE, James et al. first silylates the HA. See paragraph 66, where James et al. teaches that silylation of HA is *difficult due to its large molecular weight. (Emphasis added)*. Therefore, James et al. teaches away from the use of high molecular weight polymers. Proceeding against the teaching of the reference is a strong evidence of non-obviousness. See, e.g., *In re Hedges*, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1986); *W. L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1552, 220 USPQ 303, 312 (Fed. Cir. 1983). There is no incentive or advantage for those of ordinary skill in the art to use a polymer having high molecular weight polyethylene oxide or copolymer thereof having a melt index of about 0.5 g/10 min or less.

The reactions on HA are carried out at fairly low temperatures and in solvents. Nothing is melted in James et al. There is no mention of melt index. There is absolutely no suggestion relating to melt index. The concept of melt index is read by the Office in James et al. by the impermissible hindsight reconstruction where the Office is using the invention

taught by the applicants as a roadmap. Since applicants' specification teaches that the UHMWPE and the polyethylene oxide polymer are melt processed, the Office is reaching the conclusion that a high molecular weight or low melt index hydrophilic polymer would be needed to match the melt viscosity of UHMWPE. When the cited reference does not teach melt processing, there cannot be a suggestion for choosing a low melt index polymer, except by hindsight. Hindsight reconstruction is impermissible under the law since it contravenes the statutory mandate of Section 103 which requires judging obviousness at the point in time when the invention was made. See *Grain Processing Corp. v. American Maize-Prods. Co.*, 840 F.2d 902, 907, 5 USPQ2d 1788, 1792 (Fed. Cir. 1988). "There must be a reason or suggestion in the art for selecting the procedure used, *other than the knowledge learned from the applicant's disclosure.*" *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531-32 (Fed. Cir. 1988) (*emphasis added*). It is improper to "use that which the inventor taught against its teacher." *In re Lee*, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002).

Even if the cited reference provides a motivation to modify as the Office argues, which applicants completely disagree with, the prior art must provide a reasonable expectation of success that the proposed modification will succeed in that endeavor. Both the suggestion and expectation of success must be founded in the prior art, not in applicant's disclosure. *In re Dow Chem. Co.*, 837 F.2d at 473, 5 USPQ2d at 1531. The reasonable expectation of success is to be assessed from the perspective of one of ordinary skill in the art at the time the invention was made.

The process taught in James et al. involves preparation of an interpenetrating network (IPN). See, for example, Claim 10 of James et al., wherein the method comprises temporarily cloaking at least a portion of the hydrophilic groups of the guest (which could be a polysaccharide); intermingling at least a portion of the cloaked guest with the porous polymeric structure by diffusing the cloaked guest into at least a portion of the structure's pores; within the pores, crosslinking at least a portion of the molecules of the guest with the guest; and removing the cloaking to produce a generally hydrophilic outer surface of the outer layer. There is no expectation of success for a modification where the hydrophilic polyethylene oxide would have a high molecular weight (or low melt index). Those of ordinary skill in the art would expect that diffusion of the hydrophilic polymer (under the

conditions of James et al.) into UHMWPE would be slower or less efficient if a high molecular weight material is used. It is known in the art that rate of diffusion is inversely proportional to molecular weight. Thus, there is no reasonable expectation of success.

Further, where the prior art has not recognized the "result-effective" capability of a particular invention parameter, no expectation would exist that optimizing that parameter would successfully yield the desired improvement. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). In the *Antonie* case, the cited prior art did not have any disclosure of a tank volume to contactor ratio of 0.12. The reference did not suggest any reason to calculate the tank volume to contactor area ratio, much less to any specific magnitude. The Court of Customs and Patent Appeals reversed the PTO determination of obviousness. Here, similar to *Antonie*, James et al., fails to disclose or suggest a reason to choose melt index as a parameter, much less to choose a melt index of polyethylene oxide or copolymer thereof having a specific value of about 0.5 g/10 min or less. There is no reasonable expectation of success in arriving at the claimed invention.

In view of all of the foregoing, applicants respectfully submit that Claims 1-10 and 23-24 are patentable over James et al.

Claim 25 is also patentable over James et al. because the cited reference fails to disclose or suggest to those of ordinary skill in the art a surface layer wherein the hydrophilic polymer is distributed as a discontinuous phase in a continuous phase of ultrahigh molecular weight polyethylene. James et al. discloses a product wherein the hydrophilic polymer and the ultrahigh molecular weight polyethylene are present as an interpenetrating network (IPN). This necessarily means that the hydrophilic polymer is not present as a discontinuous phase. See paragraph [0049] of James et al.:

> [0049] An IPN is an intimate combination of at least two polymers; it is a material *network* where at least two polymer components are physically associated by being covalently linked. In general, in an IPN, at least one component is synthesized or cross-linked in the presence of the other, although the two components may or may not be bound together. It is intended that semi-IPNs fall within the category of IPNs (*Emphasis added*).

In the IPN (as well as in the semi-IPN) of James et al., there is a *network* of two polymers. The presently claimed invention of Claim 25 does not contain a network of two

polymers. On the other hand, the hydrophilic polymer is present as a discrete discontinuous phase in the invention of Claim 25. Since James et al. teaches that formation of a network is required, it can not suggest to those of ordinary skill the claimed invention which requires a discrete arrangement of the hydrophilic polymer. Accordingly, Claim 25 should not be rejected over James et al.

*Conclusion*

A favorable decision is solicited. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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# Polyethylene glycol

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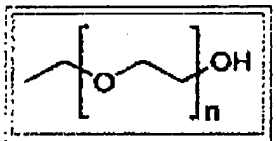

Chemical structure of the polymeric polyethylene glycol

**Polyethylene glycol** (PEG) and **polyethylene oxide** (PEO) are polymers having an identical structure except for chain length and end groups, and are the most commercially important polyethers. Polyethylene glycol refers to an oligomer or polymer with low molecular weight while polyethylene oxide is used for higher molecular weights. PEG generally is a liquid while PEO is a low-melting solid. Both are prepared by polymerization of ethylene oxide. While they find use in different applications and have different physical properties (i.e. viscosity) due to chain length effects, their chemical properties are nearly identical.

Polyethylene glycol has the following structure:

$$HO\text{-}(CH_2\text{-}CH_2\text{-}O)_n\text{-}H$$

**Pegylation** is the act of adding a PEG structure to another larger molecule, for example, a protein (which is then referred to as **pegylated**).

PEG is soluble in water, methanol, benzene, dichloromethane and is insoluble in diethyl ether and hexane. It is coupled to hydrophobic molecules to produce non-ionic surfactants.

## Uses

Polyethylene glycol is non-toxic and is used in a variety of products. It is the basis of a number of laxatives (e.g. macrogol-containing products such as Movicol® and polyethylene glycol 3350, or MiraLax®). It is the basis of many skin creams, as *cetomacrogol*, and sexual lubricants, frequently combined with glycerin.

Polyethylene glycol with added electrolytes is used for bowel preparation and drug overdoses. It is sold under the brandnames **GoLYTELY** and **Colyte**.

When attached to various protein medications, PEG allows a slow release of the carried protein. This makes for a longer acting medicinal effect and/or reduces toxicity, and allows longer dosing intervals. Examples include PEG-interferon alpha (used to treat hepatitis C) and PEG-filgrastim (Neulasta®).

It has been shown that PEG can improve healing of spinal injuries in dogs [1] (http://seattlepi.nwsource.com/health/202292_spinal04.html).

PEG is also used in liquid body armor [2] (http://www.military.com/NewsContent/0,13319,usa3_042104.00.html) and tattoos to monitor diabetes[3] (http://news.bbc.co.uk/2/hi/health/2225404.stm). Functional groups of PEG give polyurethane elastomers their "rubberiness", for applications such as foams (foam rubber) and fibers (spandex). Its backbone structure is analogous to that of silicone, another elastomer.

Since PEG is a flexible polymer, it can be used to create very high osmotic pressures (tens of atmospheres). It also is unlikely to have specific interactions with biological chemicals. These properties make PEG one of the most useful molecules for applying osmotic pressure in biochemistry experiments, particularly when using the osmotic stress technique. [4] (http://aqueous.labs.brocku.ca/osfile.html)

PEO can serve as the separator and electrolyte solvent in lithium polymer cells. Its low diffusivity often requires high temperatures of operation, but its high viscosity even near its melting point allows very thin electrolyte layers. While crystallization of the polymer can degrade performance, many of the salts used to carry charge can also serve as a kinetic barrier to the formation of crystals. Such batteries carry greater energy for their weight than other lithium ion battery technologies.

## External links

- GoLYTELY (http://www.drugs.com/cons/GoLYTELY.html) - drugs.com
- About GoLYTELY (http://www.nulytely.com/golytely/) - nulytely.com

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